# ISI-501 Series
# Off-Grid Solar Inverter
# User Manual

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## Table of Contents


1.Safety Guidelines ..... 1
2.Introduction ..... 1
  2.1 Features ..... 1
  2.2 Main Specification ..... 2
3.User Interface Panel ..... 2
  3.1 Front Panel ..... 2
  3.2 LED indicator on Front Panel ..... 3
  3.3 Rear Panel ..... 3
4.Output Voltage and Frequency Settings ..... 4
  4.1 Initial Factory State ..... 4
  4.2 Procedure to Change Output Voltage and Frequency ..... 4
5.Operating ..... 6
6.Protection ..... 7
  6.1 Input Protection ..... 7
  6.2 Output Protection ..... 7
7.Installation & Wiring ..... 7
8.Troubleshooting ..... 10
9.Warranty ..... 10


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## 1.Safety Guidelines (Please read through this manual before assembling the Inverter)

- Risk of electrical shock and energy hazard. All failures should be examined by a qualified technician. Please do not remove the case of the inverter by yourself!
- Please do not install the inverter in places with high moisture or near water.
- Please do not install the inverter in places with high ambient temperature, under direct sunlight, or near fire source.
- Please only connect batteries with the same brand and model number in one battery bank. Using batteries from different manufacturers or different capacities is strictly prohibited!
- Never allow a spark or flame in the vicinity of the batteries.
- Make sure the airflow through the fan is not obstructed on both sides (front and back) of the inverter. (Please keep any objects clear from the fan at least 15cm)
- Please do not stack any objects on the inverter as it may impede heat dissipation.
- Please turn off the inverter through the power ON/OFF switch, before removing the battery.

⚠ **WARNING: Batteries will have aging problems after years of operation. It is suggested to execute regular battery maintenance (e.g. every year). Once aged, the batteries should be changed by a professional technician, or the failed batteries may cause fire or other hazards.**

Don't disassemble

Keep away from moisture

Keep away from fire or high temperature

Don't stack on the inverter

Keep good ventilation

## 2.Introduction

- ISI-501 is a true sine wave DC/AC off-grid inverter equipped with a solar charger (with Maximum Power Point Tracking, or MPPT) which is digitally controlled by an advanced microprocessor and incorporates a high frequency design. This high performance inverter can be paired with both battery and PV modules / panels.
- ISI-501 can provide 500W pure sine wave output continuously, 550W for 1 minute, and sustain a peak load of 1000W as long as 30 AC power cycles.
- ISI-501 adopts a high frequency design which greatly reduces product weight and improves efficiency up to 88%.
- ISI-501 has a built-in solar charger with the MPPT function which effectively utilizes energy from the PV module.
- ISI-501 progresses the concept of a miniature independent power station. It is ideal for areas where the power mains is absent but PV modules are available.

### 2.1 Features

- 500W rated output
- Surge power capability up to 1000W
- True sine wave (THD<3%)

- AC output voltage regulation : ±3%
- High efficiency up to 88%
- Built in MPPT solar charger, MPPT efficiency: 98%(Typ.)
- Adjustable output voltage and frequency
- LED indication for operation and battery capacity
- Battery low alarm (with electrically isolated dry contact)
- Remote ON/OFF function
- Compliance to FCC / CE regulations
- 3 year warranty

### 2.2 Main Specification

| MODEL | | | 112 | 124 | 148 | 212 | 224 | 248 |
|---|---|---|---|---|---|---|---|---|
| INVERTER SECTION | OUTPUT | RATED POWER | 450W | 500W | | 450W | 500W | |
| | | MAXIMUM OUTPUT POWER (Typ.) | 550W for 60 sec. / surge power 1000W for 30 cycles (112, 212 models : 495W for 60 sec. / surge power 900W for 30 cycles) | | | | | |
| | | AC VOLTAGE | Factory setting set at 110VAC | | | Factory setting set at 230VAC | | |
| | | | 100 / 110 / 115 / 120VAC selectable by setting button S.W | | | 200 / 220 / 230 / 240VAC selectable by setting button S.W | | |
| | | FREQUENCY | Factory setting set at 110VAC | | | Factory setting set at 230VAC | | |
| | | | 60±0.1Hz 50/60Hz selectable by setting button S.W | | | 50±0.1Hz 50/60Hz selectable by setting button S.W | | |
| | | WAVEFORM | True sine wave (THD<3%) at rated input voltage | | | | | |
| | | AC REGULATION | ±3% | | | | | |
| | | FRONT PANEL INDICATOR | Inverter status, Charger status, Battery capacity | | | | | |
| | INPUT | BAT. VOLTAGE | 12V | 24V | 48V | 12V | 24V | 48V |
| | | VOLTAGE RANGE | 10.5 ~ 15VDC | 21 ~ 30VDC | 42 ~ 60VDC | 10.5 ~ 15VDC | 21 ~ 30VDC | 42 ~ 60VDC |
| | | DC CURRENT (Typ.) | 50A | 30A | 15A | 50A | 30A | 15A |
| | | NO LOAD CURRENT DRAW | 1.25A | 0.63A | 0.32A | 1.25A | 0.63A | 0.32A |
| | | OFF MODE CURRENT DRAW | ≦ 1mA | | | | | |
| | | EFFICIENCY (Typ.) | 85% | 87% | 87% | 86% | 88% | 88% |
| | OUTPUT PROTECTION | OVER TEMPERATURE | Shut down o/p voltage, re-power on to recover | | | | | |
| | | OUTPUT SHORT | Shut down o/p voltage, re-power on to recover | | | | | |
| | | OVER LOAD (Typ.) | 110% load for 60 sec. | | | | | |
| | | | Protection type : Shut down o/p voltage, re-power on to recover | | | | | |
| BATTERY SECTION | | CHARGER CURRENT (Typ.) | 30A | 17A | 8.5A | 30A | 17A | 8.5A |
| | | BATTERY TYPE | Open & sealed Lead Acid | | | | | |
| | | FUSE | 40A*2 | 40A*1 | 20A*1 | 40A*2 | 40A*1 | 20A*2 |
| | | BAT. LOW ALARM | 11V | 22V | 44V | 11V | 22V | 44V |
| | | BAT. LOW SHUTDOWN | 10.5V | 21V | 42V | 10.5V | 21V | 42V |
| | | REVERSE POLARITY | By internal fuse open | | | | | |
| MPPT / SOLAR SECTION | | MPPT CHARGER EFFICIENCY (peak) | 98% | | | | | |
| | | OPEN CIRCUIT VOLTAGE RANGE | 35 ~ 50V | 45 ~ 90V | 90 ~ 160V | 35 ~ 50V | 45 ~ 90V | 90 ~ 160V |
| | | MPPT RANGE | 25 ~ 50V | 35 ~ 90V | 70 ~ 160V | 25 ~ 50V | 35 ~ 90V | 70 ~ 160V |
| | | SOLAR INPUT CURRENT (Typ.) | 11A | 7A | 4.5A | 11A | 7A | 4.5A |
| | | SOLAR INPUT POWER (Typ.) | 500W | | | | | |

## 3.Main Specification

### 3.1 Front Panel

Ⓐ **AC Output Outlet:** To satisfy global demands, there are many optional AC outlets to choose from.

| Receptacle type | | | | | | | |
|---|---|---|---|---|---|---|---|
| | TYPE-A | TYPE-B | TYPE-C | TYPE-D | TYPE-E | TYPE-F | TYPE-U |
| | Standard | Standard | Optional | Optional | Optional | Optional | Optional |
| Country | USA | EUROPE | AUSTRALIA | U.K | JAPAN | GFCI | UNIVERSAL |
| Certificate | FC | CE | CE | CE | FC | FC | Non |

Ⓑ **LED Indicator (Status):** Displays the operation status of the ISI-501.
Ⓒ **LED Indicator (Battery):** Displays remaining capacity of battery.
Ⓓ **Function Setting:** Output voltage and frequency can be set through this button.
Ⓔ **Power ON/OFF Switch:** The inverter will turn OFF if the switch is in the OFF position.
Ⓕ **Ventilation Slits:** The inverter requires good ventilation for proper operation and for prolonging its lifetime.

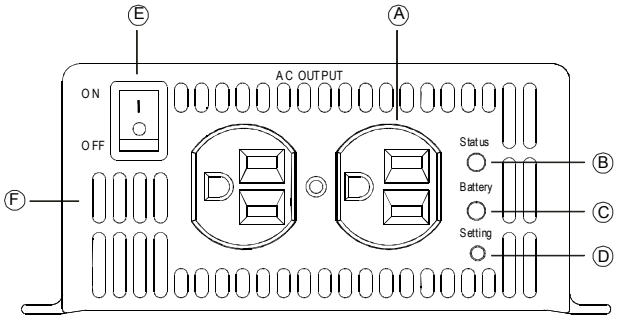



Figure 3.1 Front Panel(Type A)

### 3.2 LED Indicator On Front Panel

Operation Status Indicator (Status LED) : Represents the current ISI-501 state.

| LED Display | Green | Orange | Red |
|---|---|---|---|
| Status | Normal Operation | Remote Off | Error |

*Note : When an error occurs, please refer to chapter 8 "Troubleshooting" of the user manual.

Battery Capacity Indicator (Battery LED) : Represents the remaining capacity of external batteries.

| LED Display | Green | Orange | Red |
|---|---|---|---|
| Battery Capacity | >70% | 40 ~ 70% | <40% |

### 3.3 Rear Panel

Ⓐ **Battery Input(+),(-):** Pay extra caution to battery polarity when wiring.
Ⓑ **Fan Ventilation Opening:** The inverter requires good ventilation for proper operation and for prolonging its lifetime.
Ⓒ **Remote ON/OFF Control:** While set at ON, the ISI-501 can be powered ON/OFF through remote control.

| Connector Status | Inverter Status |
|---|---|
| Open | Remote ON |
| Short | Remote OFF |

Ⓓ **Battery Low Alarm:** This is an electrically isolated dry contact which can provide the user with an external control signal. Users will be alarmed of a low battery when the two pins are open and the ISI-501 makes a "beep" sound.

| Battery Status | Connector Status | Alarm |
|---|---|---|
| Battery Low | Connector Open | "Beep" Sound |
| Battery Normal | Connector Short | ----- |

Ⓔ **PV Input Terminal(+),(-):** Pay extra caution to PV module polarity when wiring.

Ⓕ **Grounding Terminal(FG).**

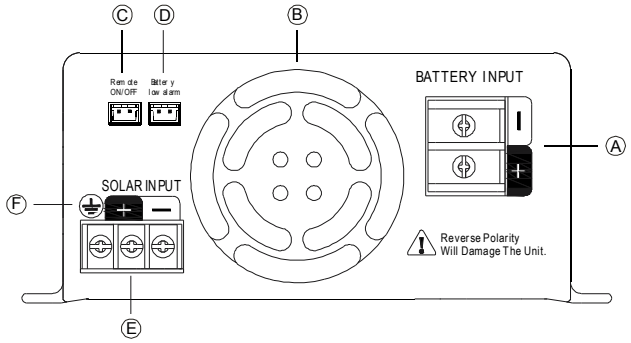



Figure 3.2 Rear Panel

## 4.Output Voltage and Frequency Settings

### 4.1 Initial Factory State

Initially the ISI-501 is set to output 110Vac at 60Hz or 230Vac at 50Hz.

### 4.2 Procedure to Change Output Voltage and Frequency

The user can adjust the output voltage and frequency through the function setting button on the front panel. After changing the settings, the inverter will restart and adopts the setup the user entered. Even if the battery is removed at a later time, or if there is no source of power, the inverter will keep the most recent setup.

Step 1: The inverter should be turned off while resetting. The input batteries should be connected and the loads should be removed.

Step 2: Use an insulated stick to press down on the setting button and then turn on the power; the panel's orange LED should flash. After pressing for 5 seconds, the inverter will send out a "beep" sound. Users can release the button and go on with the setting procedure.

Step 3: Check output voltage and frequency with table 4-1. If the output is desired, please continue to step 5; if not, please continue adjusting according to step 4 until it is.

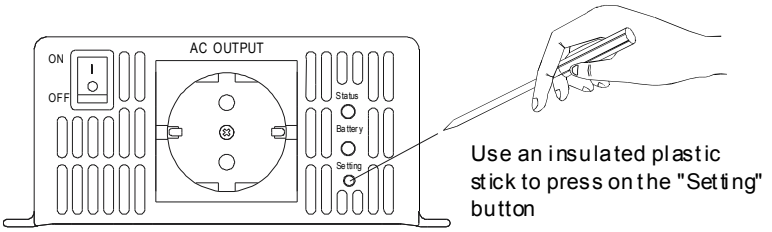



Figure 4.1 Adjusting output voltage and frequency

Table 4-1 Voltage & Frequency Chart

| Frequency \ O/P Voltage | | 100Vac (200Vac) | 110Vac (220Vac) | 115Vac (230Vac) | 120Vac (240Vac) |
|---|---|---|---|---|---|
| 50Hz | Status | ● Red | ● Red | ● Red | ● Red |
| | Battery | ● Green | ★ Green | ● Yellow | ★ Yellow |
| 60Hz | Status | ★ Red | ★ Red | ★ Red | ★ Red |
| | Battery | ● Green | ★ Green | ● Yellow | ★ Yellow |

● Light ★ Flashing

Step 4: Press the setting button for around 1 second before letting it go. The LED indicators (Table 4-1) will change with status. Please adjust accordingly.

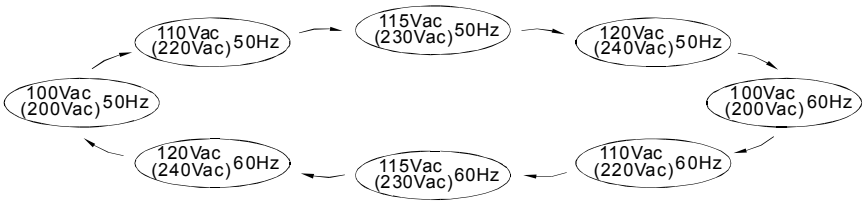



Figure 4.2 Output voltage & frequency changing sequence

Step 5: When the output is at user's desired value, press and hold the setting button for 3~5 seconds until the inverter makes a "beep" sound. The output setting is now complete; the inverter will now save the settings and restart.

**5.Operation**

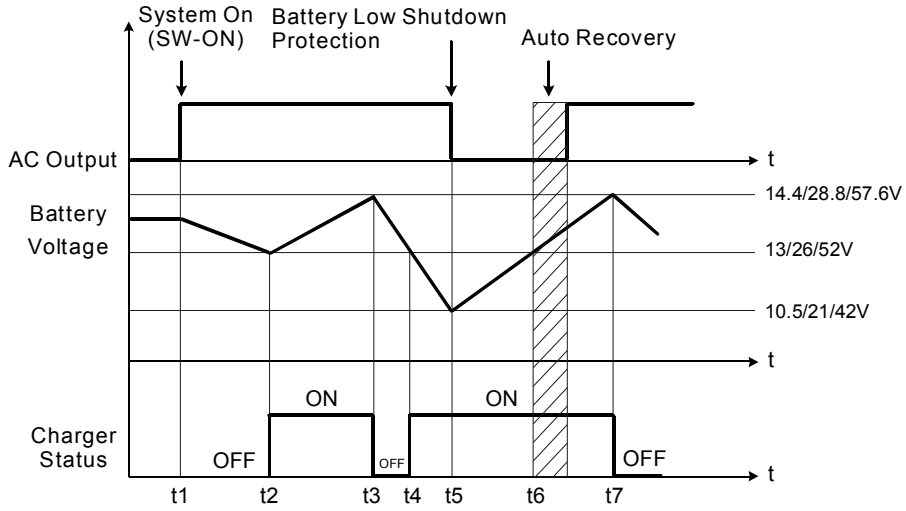



Figure 5.1 Operation Sequence

t1: When user turns on the ISI-501, battery voltage will be sensed. If battery voltage is greater than 13/26/52V, it means the battery is adequately charged and the charger circuit will remain de-activated to prevent overcharging.

t2: While the ISI-501 operates, battery voltage will slowly drop; when battery voltage is lower than 13/26/52V, battery low signal will be detected and the charger will automatically activate and charge accordingly.

t3: If the power provided by the PV module is greater than the load consumption, the battery voltage will increase. When this battery voltage reaches 14.4/28.8/57.6V, the charger circuit will stop charging the battery modules to prevent the batteries from overcharging.

t4: When battery voltage drops to 13/26/52V again，the charger will automatically restart the charging action.

t5: If the power provided by the PV module is less than load consumption, even if the charger is operating, the battery voltage will still drop. When battery voltage is below 10.5/21/42V, the ISI-501 will shut down to prevent the battery from over discharging thereby increasing its lifetime.

t6: If the charger continuously charges the battery, the battery voltage will slowly increase. When battery voltage reaches 13/26/52V, the system will re-power on after three minutes and start providing AC voltage output.

t7: Same action as t3.
The status of the inverter changes depending on the power provided by the PV module and its load consumption.

## 6.Protection

### 6.1 Input Protection

**(A)PV Module Reverse Polarity Protection:** In the case where the user accidently reverses the polarity of the PV module, the ISI-501 internal fuse will blow to protect other circuitry. Please contact your nearest distributer or send the inverter back to Mean Well for repair.

**(B)Battery Reverse Polarity Protection:** In the case where the user accidently reverses the polarity of the battery connection, the ISI-501 internal fuse will blow to protect other circuitry. Please contact your nearest distributer or send the inverter back to Mean Well for repair.

**(C)Battery Low Shutdown Protection:** When the battery voltage is lower than 10.5/21/42V, the ISI-501 will shut down to guarantee the lifetime of the battery.

**(D)Battery Overvoltage Protection:** When the battery voltage is too high, the inverter will shut down and the built-in alarm will sound. Please resolve the error and restart the inverter to return to normal operation.

**⚠ WARNING:**

**Before installation or after use, make sure the power ON/OFF switch on the front panel is in the OFF position to safely wire or remove batteries.**
**Under normal working conditions, please choose suitable batteries that are within the input DC voltage range of the inverter (refer to spec).**
**If the input DC voltage is too low (e.g. using 12Vdc battery bank for 24Vdc models), the inverter cannot startup properly.**
**If the input DC voltage is too high (e.g. using 48Vdc battery bank for 24Vdc models), the inverter will be damaged.**

### 6.2 Output Protection

If the ISI-501 detects any of the following errors while operating, the status red LED indicator will remain until the error is removed.

**(A)Over Temperature Protection(OTP) :** When the internal temperature of the ISI-501 reaches a threshold, over temperature protection will activate, causing shutdown of the inverter. Wait at least 30 minutes before restarting to recover normal operation.

**(B) AC Output Short Circuit Protection:** When the AC output of the ISI-501 is short circuited, it will go into protection mode. Restart to recover normal operation.

**(C) Over Load Protection:** When the load is in the over load range of 500~550W (450~495W for 112/212 models), the inverter can continue supplying power for a short duration of 1 minute. If the load is not removed, the sensing circuit will activate causing shut down.

## 7. Installation & Wiring

**(A)Wiring for batteries:** Wire connection should be made as short as possible, 1.5m or less is strongly recommended. Also make sure suitable wires are chosen based on safety requirement and current rating. Cross sections that are too small will result in lower efficiency, less output power, and the wires may also become

overheated and cause danger. Please refer to table 7.1 or consult with our distributors or us if you have any questions.

Table 7-1 Suggestion for wire selection

| Cross section of wire lead($mm^2$) | AWG | Suggested Model |
|---|---|---|
| 1.5 | 14 | PV module input wire |
| 2.5 | 12 | 48V battery models |
| 4 | 10 | 24V battery models |
| 6 | 8 | 12V battery models |

**(B)Suggested Battery Type and Capacity**

| Battery Type | Lead-acid | | |
|---|---|---|---|
| Battery Capacity | 12V models | 24V models | 48V models |
| | 12V / 120Ah ~ 12V / 400Ah | 24V / 60Ah ~ 24V / 200Ah | 48V / 30Ah ~ 48V / 100Ah |

Note : If the desired battery type is not Lead-Acid based, please contact the battery manufacturer for an advised value.

**(C)Installation Requirements:**

- The ISI-501 unit should be mounted on a flat surface or holding rack with suitable strength. In order to ensure the lifespan of the unit, please refrain the unit from operating in dusty or moist environments. This is a power unit with a built-in DC fan. Please make sure the ventilation openings are not blocked ; please do not drive the inverter continuously under heavy load in high ambient environment because it may prevent the inverter from functioning properly and the inverter's lifespan may be affected. It is highly recommended that there should be no objects impeding airflow within 15cm of the ventilation openings.

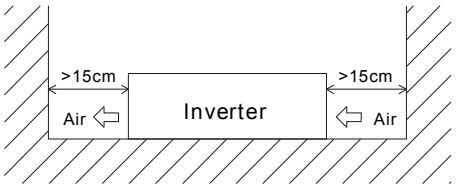
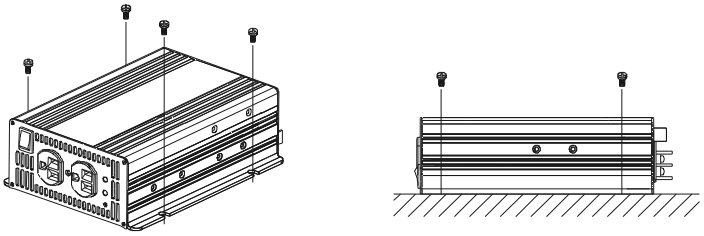


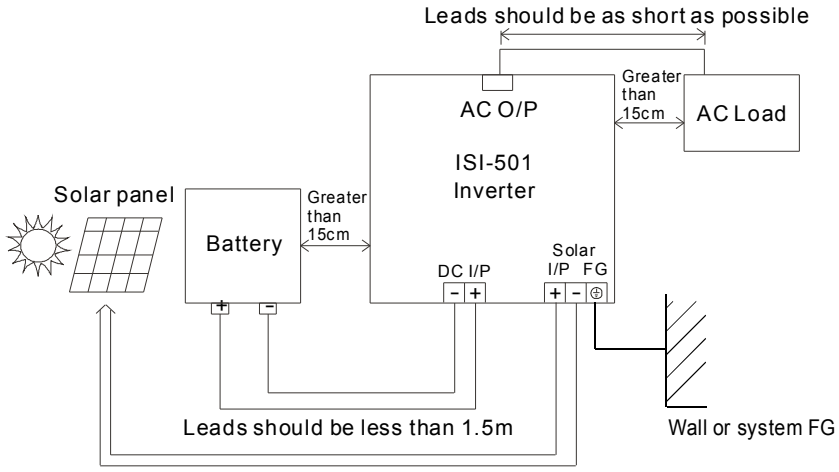

Figure 7.1: Example of Installation

**(D)Suggested Mounting**

The four holes on the sides of the case allow the users to mount and fix the ISI-501 on a flat surface. (It is highly recommended the ISI-501 is placed horizontally. Also, please pay attention to the ventilation.)



**(E)Example of System Setup**




Based on the actual length of wiring, choose suitable cross-section of the leads

**(F)Derating**

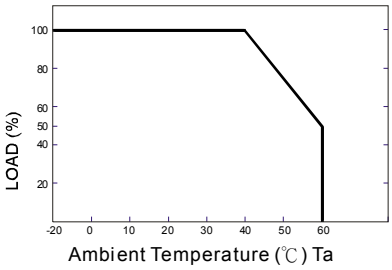



Figure 7.2 Output Derating Curve

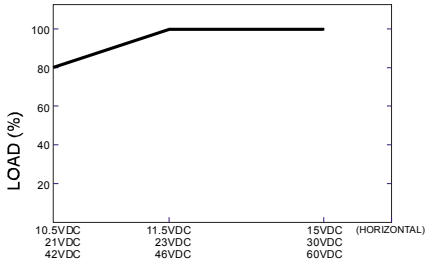



Figure 7.3 Input Derating Curve

**(G) ⚠ Notes on Output Loads:**

**ISI-501 Series can power most equipments requiring an AC source of 500W continuously for a long time, but for certain type of load, this inverter may not work properly.**

(1)Since inductive loads or motor based equipments need a large start up current (6~10 times of its rated current), please make sure this startup current is less than the maximum current capability of the ISI-501.

(2)When the loads are capacitive or rectified equipment (such as switching power supply), it is suggested to operate the equipment at no load or light load during power ON. Increase the load slowly only after the ISI-501 is powered up normally and steadily to ensure proper operation.

## 8. Troubleshooting

The ISI-501 is a complex product which should be serviced by professional technicians. Improper usage or modification may damage the unit or result in shock hazards. If you are not able to clear the failure condition according to the following instructions, please contact us or your closest distributor for repair service.

| Failure Statue | Possible Reasons | Recommended Solutions |
|---|---|---|
| No AC Output Voltage | Abnormal input | Check the DC input source (PV/ battery) to make sure the voltage is within the specified range |
| | Over temperature protection | Make sure the ventilation is not blocked and the ambient temperature is not too high. Please derate the load or lower the ambient temperature |
| | Overload protection | Make sure the output load does not exceed the rated value or the peak startup current is not too high, typically found in inductive or capacitive loads |
| | Short circuit protection | Make sure the output is not overloaded or short circuited |
| Battery Discharging Period too short | Battery aged or broken | Replace the batteries |
| | Battery capacity is too small | Reconfirm battery specification and enlarge the battery capacity as suggested |

## 9. Warranty

**Three years of warranty is provided under normal operating conditions. Please do not change components or modify the unit by yourself or attempt to repair the unit by yourself because Mean Well reserves the right to void the warranty.**

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